

## REMARKS

The Applicant has filed the present Amendment in reply to the outstanding Office Action of October 10, 2006, and Applicants believe the Amendment to be fully responsive to the Office Action for the reasons set forth below.

In the Office Action, Claims 2-7 have now been allowed. Additionally, Claim 10 was objected to as being dependent upon a rejected base claim but would be allowable if rewritten in independent form. Summarizing the Office Action, Claims 1, 8, 9, 11 and 12 have been rejected under 35 U.S.C. §103(a) as defining subject matter that is allegedly obvious. Specifically, Claim 1 and 8 were rejected under 35 U.S.C. §103(a) as obvious over Pundak (U.S. Patent No. 6,397,605) (hereafter “Pundak”) in combination with Zhu, *et al.* (U.S. Patent No. 6,094,921) (hereinafter “Zhu”). Claim 9 was rejected under 35 U.S.C. §103(a) as obvious over the combination of Pundak, Zhu and Inoue, *et al.* (U.S. Patent No. 6,301,902) (hereinafter “Inoue”). Claims 11 and 12 were rejected under 35 U.S.C. §103(a) as obvious over the combination of Pundak, Zhu, and Winkler (U.S. Patent No. 4,485,631) (hereinafter “Winkler”).

The Examiner states Pundak teaches the invention but does not teach using valves to control the phase change, using rotary disk with primary and secondary disks, and using a pulse tube to cool a cryopanel. The Examiner then relies on Zhu to show using valves, and on Inoue to show using a rotary disk with primary and secondary discs, and on Winkler to show using a pulse tube to cool a cryopanel to be old in the pulse tube art.

Applicants respectfully traverse this rejections and request their withdrawal in view of the reasons, arguments, and evidence presented in the paragraphs that follow.

In order for a rejection of claims to stand and a patent to be denied under 35 U.S.C. §103, the prior art must be such that the subject matter of the present application as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art.

The Applicant respectfully disagrees with the Examiner's allegations pursuant to 35 U.S.C. §103(a), and as a consequence, Applicant proffers the following arguments directed to patentability of the claimed invention.

In traversing the rejection of Claims 1 and 8 pursuant to 35 U.S.C. §103(a), the Applicant respectfully submits that the Pundak and Zhu combination is deficient in that it fails to teach or suggest the present invention.

Pundak is directed to a Stirling cycle cooler with a pneumatically driven displacer that has a resonant frequency by virtue of its mass and a spring. The compressor speed can be changed with a resulting change in the phase relation of the compressor and expander so that it can produce cooling at one speed and heating at another. Many Stirling cycle coolers have been built in which the compressor piston and expander piston are driven by crank shafts from a common drive shaft. It has long been known that operation in the direction that is reverse from cooling produces heating. For GM type expanders that have an expander crank shaft and a valve mechanism on a common drive shaft, operation in reverse produces heating. An example of this type of GM type expander is found in U.S. Patent No. 5,361,588 which describes a valve mechanism that enhances the heating effect when the direction of rotation is reversed. Many GM type expanders, such as that described in U.S. Patent No. 3,620,029 will not warm up if the valve rotation is reversed.

The Zhu patent is one of many that describes GM type pulse tubes that use valves to control the phase shifting that produces cooling. Nowhere in the art of pulse tube refrigerators is there a suggestion of changing from a cooling mode to a warming mode by any other means other than to stop operation and allow gas to flow through the pulse tube. Moreover, no valve configuration or valve timings have been suggested that can facilitate changing from cooling to heating as taught in Claims 1 and 8 of the present invention. Therefore, these claims cannot be rendered obvious by the combination of Pundak and Zhu.

For Claim 9, the combination of the teachings of the Pundak, Zhu and Inoue patents does not lead to the concepts of claim 9 which describes the two piece valve shown in Fig. 6 which optimizes the heating effect. Inoue describes several different valve structures that enable several pulse tubes to be operated in parallel from a common compressor. Fig. 10 of the Inoue patent shows a two piece valve that supplies gas to the regenerators through one disc and gas to the warm ends of the pulse tubes through the others. Unlike the references cited, the present invention pertains to a method for changing the phase relation to switch from cooling to warming. Additionally, the valve discs do provide options for pressurizing and depressurizing multiple pulse tubes together or sequentially. There is nothing to suggest that combining the valve concepts of Inoue in combination with Pundak and Zhu would arrive at the teaching of claim 9 of the present invention. In fact, Inoue teaches away from the present invention as defined in Claim 9, and such teaching away is indicative of nonobviousness.

The Federal Circuit has stated that the references must be “reasonably pertinent to the particular problem with which the inventor is involved”. Turning to the rejection of Claims 11 and 12 over the combination of Pundak, Zhu and Winkler, Applicants point out that Winkler describes a method of warming a cryopump cooled by a GM expander by diverting some of the

gas from the compressor direct to the cold end, while the expander continues to provide cooling. Therefore, inasmuch as Winkler does not pertain to the subject matter of the present invention, Winkler represents nonanalogous art.

Applicants respectfully disagree with the Examiner's assertion that Winkler suggests that cryopanels can be attached to a pulse tube that can warm the cryopanel by having the pulse tube operate in a warming mode.

The present invention is based on Applicant's own surprising discovery of a method of quickly warming a pulse tube.

Thus, there would be no motivation whatsoever to combine these references as suggested by the Examiner. Nor does the combination lead to the present invention for at least the reasons cited hereinabove. However Pundak, Zhu, Inoue, or Winkler may be combined, they do not make the invention obvious. None of the cited references suggest in any manner the improved method of quickly warming a pulse tube of the present invention.

Applicant accordingly maintains that the invention of Claims 1-12 is novel and inventive, and is not made obvious by the cited references.

In view of the remarks set forth above, this application is in condition for allowance, which action is respectfully requested. However, if for any reason the Examiner should consider this application not to be in condition for allowance, the Examiner is respectfully requested to telephone the undersigned attorney at the number listed below prior to issuing a further Action.

Any fee due with this paper may be charged to Deposit Account No. 50-1290.

Respectfully submitted,

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